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Memorandum

PPM-92-171

DATE: June 1, 1992
TO: J. Lohr/311
FROM: K. Sahu/7809 *KS*
SUBJECT: Radiation Report on GGS/WIND/3D PLASMA Project
Part No. AD7541ATQ/883B (control no.6299)

cc: L. Rabb/406
A. Sharma/311
Library/300.1

A radiation evaluation was performed on the AD7541ATQ/883B D/A Converter to determine the total dose tolerance of these parts. A brief summary of the test results is provided below. For detailed information, refer to Tables I through IV and Figure 1.

The total dose testing was performed using a cobalt-60 gamma-ray source. During the radiation testing, three parts were irradiated under bias (see Figure 1 for bias configuration), and one part was used as a control sample. The total dose radiation steps were 5, 10, 15 and 20 krads (the term rad as used here means rad(Si)). After 20 krads, parts were annealed at +25°C for 168 hours. The dose rate was 0.05 - 0.11 krads/hour (see Table II for radiation schedule). After each radiation exposure and annealing treatment, the part was electrically tested at +25°C according to the test conditions and the specification limits listed in Table III.

The parts passed all initial electrical tests. After 5 krads, SN 68 exceeded the specification limits for GAIN1, Linearity, Diff. Linearity and IZS1. After 10 krads, all three parts exceeded the specification limits for GAIN1 and IZS1. Degradation in these parameters increased at 15 and 20 krads. Parts also exceeded specification limits for IZS2 and IDD1 at 15 and 20 krads. No significant recovery was observed after annealing at 25°C for 168 hours.

Table IV gives the electrical measurements for the irradiated part after each irradiation exposure and annealing step.

Any further details about this evaluation can be obtained upon request. If you have any questions, please call me at (301) 731-8954.

TABLE I. Part Information

Generic Part Number:	AD7541ATQ
GGG/WIND/3D PLASMA Part Number:	AD7541ATQ/883B
Control Number:	6300
Charge Number:	C23769
Manufacturer:	Analog Devices
Lot Date Code:	9008
Quantity Tested:	4
Serial Number of Radiation Sample:	68, 69, 70
Serial Number of Control Sample:	67
Part Function:	12-bit D/A Converter
Part Technology:	CMOS
Package Style:	18-pin DIP
Test Engineer:	A. Phung

TABLE II. Radiation Schedule for MP7623TD

EVENTS	DATE
1) INITIAL (PRE-IRRADIATION) ELECTRICAL MEASUREMENT	04/17/92
2) 5- KRAD IRRADIATION (0.11 krads/hour) POST-5-KRAD ELECTRICAL MEASUREMENT	04/20/92 04/22/92
3) 10-KRAD IRRADIATION (0.05 krads/hour) POST-10-KRAD ELECTRICAL MEASUREMENT	04/22/92 04/24/92
4) 15-KRAD IRRADIATION (0.11 krads/hour) POST-15-KRAD ELECTRICAL MEASUREMENT	04/24/92 04/29/92
5) 20-KRAD IRRADIATION (0.05 KRAD/HOUR) POST-20-KRAD ELECTRICAL MEASUREMENT	04/29/92 05/01/92
6) 168 HOURS ANNEALING AT +25°C POST-168-HOUR ELECTRICAL MEASUREMENTS	05/01/92 05/08/92

ALL ELECTRICAL MEASUREMENTS WERE PERFORMED AT +25°C.

PARTS WERE IRRADIATED AND ANNEALED UNDER BIAS; SEE FIGURE 1.

Table III. Electrical Characteristics of AD7541ATQ

TESTS PERFORMED @ 25°C
 +Vdd = 15V, Vref = 10V, Out1 = Out2 = 0V, unless otherwise specified.

Test	Min	Max	Units
+ICC1	0	+2000	uA
GAIN1	-73.2	+73.2	m%FS
Linearity	-12.2	+12.2	m%FS
Diff. Lin.	-12.2	+12.2	m%FS
dFS1+	-10	+10	m%FS
IIL	-1	0	uA
IIH	0	-1	uA
IZS1	-50	+50	nA
IZS2	-50	+50	nA
IREF_POS	0	+500	uA
IREF_NEG	-2	0	mA
IDD1	0	+100	uA
IDD2	0	+2	mA

TABLE IV: Summary of Electrical Measurements After Total Dose Exposures and Annealing Steps for AD7541ATQ 1/

Parameters	Unit	Spec. Limits min max		Total Dose Exposure (krads)										Anneal	
				0 (Pre-Rad)		5		10		15		20		168 hours @25°C	
				mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
+ICCI	uA	0	2000	0.01	0	0.94	.02	0.91	.01	0.89	.01	0.88	.01	0.88	.01
GAIN1	m%FS	-73.2	73.2	14.68	5.4	201	286	100	0	100	0	100	0	100	0
LIN	m%FS	-12.2	12.2	5.35	1.6	132	215	4.25	0.2	4.41	.24	4.86	0.5	5.52	1.3
DIFF LIN	m%FS	-12.2	12.2	4.82	2.9	252	425	3.82	.15	3.78	.06	3.75	.13	5.58	1.6
dFS1+	m%FS	-	10	-0.1	0.2	-476	508	-0.10	.18	-0.10	.18	-0.21	.18	-1.26	0.9
IIL	uA	-1	0	0	-	0	-	0	-	0	-	0	-	0	-
IIH	uA	0	-1	0	-	0	-	0	-	0	-	0	-	0	-
IZS1	nA	-	50	0	-	359.5	45	6E5	1.2E4	6E5	1.2E4	6E5	1.2E4	6E5	1.2E4
IZS2	nA	-50	50	0	-	0	-	10.33	0.5	90.33	3.3	180.7	3.9	174.7	4.1
IREF_POS	uA	0	500	92.53	1.1	95.13	1.1	97.03	1.4	99.10	1.3	100.6	1.3	100.8	1.4
IREF_NEG	mA	-2	0	0.57	.01	0.57	.01	0.57	.01	0.57	.01	0.57	.01	0.57	.01
IDD1	uA	-	100	0	-	0	-	0	-	190.3	269	0	-	0	-
IDD2	mA	-	2	0	-	1.59	0.3	0.57	-	0.57	-	0.38	0.27	0.57	-

Notes:

1/ The control sample remained constant throughout the testing and is not included in this table.

Figure 1. Radiation Bias Circuit for AD7541ATQ

